

Tool 17

Continuous Stream Walk Assessment Methods

Field Sheets

This tool contains the field sheets to conduct the Center for Watershed Protection's Unified Stream Assessment (USA) and the Maryland Department of Natural Resource's Stream Corridor Assessment (SCA). Both are continuous stream walk methods that systematically evaluate conditions and identify restoration opportunities within the stream corridor. For more details on USA and guidance for completing the field forms, see Kitchell and Schueler, 2004.

Unified Stream Assessment (USA)

WATERSHED/SUBSHED:		DATE: ____/____/____		ASSESSED BY:																	
SURVEY REACH ID:		TIME: ____:____AM/PM		PHOTO ID: (Camera-Pic #) ____/#																	
SITE ID (Condition-#): OT-____		LAT ____° ____' ____" LONG ____° ____' ____" LMK ____		GPS: (Unit ID)																	
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; vertical-align: top;"> BANK: <input type="checkbox"/> LT <input type="checkbox"/> RT <input type="checkbox"/> Head </td> <td style="width: 15%; vertical-align: top;"> TYPE: <input type="checkbox"/> Closed pipe <input type="checkbox"/> Open channel </td> <td style="width: 15%; vertical-align: top;"> MATERIAL: <input type="checkbox"/> Concrete <input type="checkbox"/> Metal <input type="checkbox"/> PVC/Plastic <input type="checkbox"/> Brick <input type="checkbox"/> Other: </td> <td style="width: 15%; vertical-align: top;"> SHAPE: <input type="checkbox"/> Single <input type="checkbox"/> Double <input type="checkbox"/> Circular <input type="checkbox"/> Elliptical <input type="checkbox"/> Triple <input type="checkbox"/> Other: </td> <td style="width: 15%; vertical-align: top;"> DIMENSIONS: Diameter: ____ (in) Depth: ____ (in) Width (Top): ____ (in) " (Bottom): ____ (in) </td> <td style="width: 15%; vertical-align: top;"> SUBMERGED: <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully </td> </tr> <tr> <td colspan="6" style="text-align: center; height: 50px;"> <div style="border: 1px solid black; width: 100%; height: 100%; position: relative;"> NOT APPLICABLE </div> </td> </tr> </table>						BANK: <input type="checkbox"/> LT <input type="checkbox"/> RT <input type="checkbox"/> Head	TYPE: <input type="checkbox"/> Closed pipe <input type="checkbox"/> Open channel	MATERIAL: <input type="checkbox"/> Concrete <input type="checkbox"/> Metal <input type="checkbox"/> PVC/Plastic <input type="checkbox"/> Brick <input type="checkbox"/> Other:	SHAPE: <input type="checkbox"/> Single <input type="checkbox"/> Double <input type="checkbox"/> Circular <input type="checkbox"/> Elliptical <input type="checkbox"/> Triple <input type="checkbox"/> Other:	DIMENSIONS: Diameter: ____ (in) Depth: ____ (in) Width (Top): ____ (in) " (Bottom): ____ (in)	SUBMERGED: <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully	<div style="border: 1px solid black; width: 100%; height: 100%; position: relative;"> NOT APPLICABLE </div>									
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CONDITION: <input type="checkbox"/> None <input type="checkbox"/> Chip/Cracked <input type="checkbox"/> Peeling Paint <input type="checkbox"/> Corrosion <input type="checkbox"/> Other:	ODOR: <input type="checkbox"/> No <input type="checkbox"/> Gas <input type="checkbox"/> Sewage <input type="checkbox"/> Rancid/Sour <input type="checkbox"/> Sulfide <input type="checkbox"/> Other:	DEPOSITS/STAINS: <input type="checkbox"/> None <input type="checkbox"/> Oily <input type="checkbox"/> Flow Line <input type="checkbox"/> Paint <input type="checkbox"/> Other:	VEGGIE DENSITY: <input type="checkbox"/> None <input type="checkbox"/> Normal <input type="checkbox"/> Inhibited <input type="checkbox"/> Excessive <input type="checkbox"/> Other:	PIPE BENTHIC GROWTH: <input type="checkbox"/> None <input type="checkbox"/> Brown <input type="checkbox"/> Orange <input type="checkbox"/> Green <input type="checkbox"/> Other:																	
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="3" style="width: 10%; text-align: center; vertical-align: middle;">FOR FLOWING ONLY</td> <td style="width: 10%;">COLOR:</td> <td colspan="4"><input type="checkbox"/> Clear <input type="checkbox"/> Brown <input type="checkbox"/> Grey <input type="checkbox"/> Yellow <input type="checkbox"/> Green <input type="checkbox"/> Orange <input type="checkbox"/> Red <input type="checkbox"/> Other:</td> </tr> <tr> <td>TURBIDITY:</td> <td colspan="4"><input type="checkbox"/> None <input type="checkbox"/> Slight Cloudiness <input type="checkbox"/> Cloudy <input type="checkbox"/> Opaque</td> </tr> <tr> <td>FLOATABLES:</td> <td colspan="4"><input type="checkbox"/> None <input type="checkbox"/> Sewage (toilet paper, etc.) <input type="checkbox"/> Petroleum (oil sheen) <input type="checkbox"/> Other:</td> </tr> </table>						FOR FLOWING ONLY	COLOR:	<input type="checkbox"/> Clear <input type="checkbox"/> Brown <input type="checkbox"/> Grey <input type="checkbox"/> Yellow <input type="checkbox"/> Green <input type="checkbox"/> Orange <input type="checkbox"/> Red <input type="checkbox"/> Other:				TURBIDITY:	<input type="checkbox"/> None <input type="checkbox"/> Slight Cloudiness <input type="checkbox"/> Cloudy <input type="checkbox"/> Opaque				FLOATABLES:	<input type="checkbox"/> None <input type="checkbox"/> Sewage (toilet paper, etc.) <input type="checkbox"/> Petroleum (oil sheen) <input type="checkbox"/> Other:			
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OTHER CONCERNS: <input type="checkbox"/> Excess Trash (paper/plastic bags) <input type="checkbox"/> Dumping (bulk) <input type="checkbox"/> Excessive Sedimentation <input type="checkbox"/> Needs Regular Maintenance <input type="checkbox"/> Bank Erosion <input type="checkbox"/> Other:																					
POTENTIAL RESTORATION CANDIDATE <input type="checkbox"/> Discharge investigation <input type="checkbox"/> Stream daylighting <input type="checkbox"/> Local stream repair/outfall stabilization <input type="checkbox"/> no <input type="checkbox"/> Storm water retrofit <input type="checkbox"/> Other:																					
If yes for daylighting: Length of vegetative cover from outfall: ____ ft Type of existing vegetation: ____ Slope: ____°																					
If yes for stormwater: Is stormwater currently controlled? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not investigated Land Use description: ____ Area available: ____																					
OUTFALL SEVERITY: (circle #)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.</td> <td style="width: 20%;">Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.</td> <td style="width: 20%;">Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.</td> </tr> <tr> <td style="text-align: center;">5</td> <td style="text-align: center;">4</td> <td style="text-align: center;">3</td> </tr> </table>					Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.	Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.	5	4	3										
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5	4	3																			
SKETCH/NOTES:																					
REPORTED TO AUTHORITIES: <input type="checkbox"/> YES <input type="checkbox"/> NO																					

[illegible]

WATERSHED/SUBSHED:				DATE: ____/____/____		ASSESSED BY:	
SURVEY REACH:			TIME: ____:____AM/PM		PHOTO ID: (Camera-Pic #) ____/#		
SITE ID: (Condition-#)		START	LAT ____° ____' ____"	LONG ____° ____' ____"	LMK ____		GPS: (Unit ID)
IB-____		END	LAT ____° ____' ____"	LONG ____° ____' ____"	LMK ____		
IMPACTED BANK: <input type="checkbox"/> LT <input type="checkbox"/> RT <input type="checkbox"/> Both		REASON INADEQUATE: <input type="checkbox"/> Lack of vegetation <input type="checkbox"/> Too narrow <input type="checkbox"/> Widespread invasive plants <input type="checkbox"/> Recently planted <input type="checkbox"/> Other:					
LAND USE: (Facing downstream) LT Bank		Private	Institutional	Golf Course	Park	Other Public	
RT Bank		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> :	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> :	
DOMINANT LAND COVER:		Paved	Bare ground	Turf/lawn	Tall grass	Shrub/scrub	Trees
LT Bank		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> :
RT Bank		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> :
INVASIVE PLANTS:		<input type="checkbox"/> None	<input type="checkbox"/> Rare	<input type="checkbox"/> Partial coverage	<input type="checkbox"/> Extensive coverage	<input type="checkbox"/> unknown	
STREAM SHADE PROVIDED?		<input type="checkbox"/> None	<input type="checkbox"/> Partial	<input type="checkbox"/> Full	WETLANDS PRESENT? <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown		
POTENTIAL RESTORATION CANDIDATE <input type="checkbox"/> Active reforestation <input type="checkbox"/> Greenway design <input type="checkbox"/> Natural regeneration <input type="checkbox"/> Invasives removal <input type="checkbox"/> no <input type="checkbox"/> Other:							
RESTORABLE AREA		REFORESTATION POTENTIAL: (Circle #)		Impacted area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting		Impacted area on either public or private land that is presently used for a specific purpose; available area for planting adequate	
LT BANK RT							
Length (ft): _____							
Width (ft): _____							
				5 4 3 2 1			
POTENTIAL CONFLICTS WITH REFORESTATION <input type="checkbox"/> Widespread invasive plants <input type="checkbox"/> Potential contamination <input type="checkbox"/> Lack of sun <input type="checkbox"/> Poor/unsafe access to site <input type="checkbox"/> Existing impervious cover <input type="checkbox"/> Severe animal impacts (deer, beaver, cattle) <input type="checkbox"/> Other:							
NOTES:							

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SURVEY REACH ID:		TIME: ____:____ AM/PM		PHOTO ID: (Camera-Pic #) ____/##				
SITE ID: (Condition-#) SC-____		LAT ____° ____' ____" LONG ____° ____' ____" LMK ____		GPS (Unit ID)				
TYPE: <input type="checkbox"/> Road Crossing <input type="checkbox"/> Railroad Crossing <input type="checkbox"/> Manmade Dam <input type="checkbox"/> Beaver Dam <input type="checkbox"/> Geological Formation <input type="checkbox"/> Other:								
FOR ROAD/ RAILROAD CROSSINGS ONLY	SHAPE: <input type="checkbox"/> Arch <input type="checkbox"/> Bottomless <input type="checkbox"/> Box <input type="checkbox"/> Elliptical <input type="checkbox"/> Circular <input type="checkbox"/> Other:		# BARRELS: <input type="checkbox"/> Single <input type="checkbox"/> Double <input type="checkbox"/> Triple <input type="checkbox"/> Other:	MATERIAL: <input type="checkbox"/> Concrete <input type="checkbox"/> Metal <input type="checkbox"/> Other:	ALIGNMENT: <input type="checkbox"/> Flow-aligned <input type="checkbox"/> Not flow-aligned <input type="checkbox"/> Do not know	DIMENSIONS: (if variable, sketch) Barrel diameter: ____ (ft) Height: ____ (ft)		
	CONDITION: (Evidence of...) <input type="checkbox"/> Cracking/chipping/corrosion <input type="checkbox"/> Downstream scour hole <input type="checkbox"/> Sediment deposition <input type="checkbox"/> Failing embankment <input type="checkbox"/> Other (describe):			CULVERT SLOPE: <input type="checkbox"/> Flat <input type="checkbox"/> Slight (2° – 5°) <input type="checkbox"/> Obvious (>5°)	Culvert length: ____ (ft) Width: ____ (ft)			
					Roadway elevation: ____ (ft)			
POTENTIAL RESTORATION CANDIDATE <input type="checkbox"/> Fish barrier removal <input type="checkbox"/> Culvert repair/replacement <input type="checkbox"/> Upstream storage retrofit <input type="checkbox"/> no <input type="checkbox"/> Local stream repair <input type="checkbox"/> Other:								
IS SC ACTING AS GRADE CONTROL <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown								
<i>If yes for fish barrier</i>	EXTENT OF PHYSICAL BLOCKAGE: <input type="checkbox"/> Total <input type="checkbox"/> Partial <input type="checkbox"/> Temporary <input type="checkbox"/> Unknown			BLOCKAGE SEVERITY: (circle #)				
	CAUSE: <input type="checkbox"/> Drop too high Water Drop: ____ (in) <input type="checkbox"/> Flow too shallow Water Depth: ____ (in) <input type="checkbox"/> Other:			A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.		
				5	4	3	2	1
NOTES/SKETCH:								
REPORTED TO AUTHORITIES <input type="checkbox"/> YES <input type="checkbox"/> NO								

[illegible]

WATERSHED/SUBSHED:						DATE: ___/___/___			ASSESSED BY:					
SURVEY REACH ID:							TIME: ___:__AM/PM			PHOTO ID: (<i>Camera-Pic #</i>) /#				
SITE ID: (<i>Condition-#</i>) TR-____				LAT ____° ____' ____" LONG ____° ____' ____" LMK _____								GPS: (<i>Unit ID</i>)		
TYPE: <input type="checkbox"/> Industrial <input type="checkbox"/> Commercial <input type="checkbox"/> Residential		MATERIAL: <div style="display: flex; justify-content: space-between;"> <input type="checkbox"/> Plastic <input type="checkbox"/> Paper <input type="checkbox"/> Metal <input type="checkbox"/> Tires <input type="checkbox"/> Construction <input type="checkbox"/> Medical </div> <div style="display: flex; justify-content: space-between;"> <input type="checkbox"/> Appliances <input type="checkbox"/> Yard Waste <input type="checkbox"/> Automotive <input type="checkbox"/> Other: </div>				SOURCE: <input type="checkbox"/> Unknown <input type="checkbox"/> Flooding <input type="checkbox"/> Illegal dump <input type="checkbox"/> Local outfall			LOCATION: <input type="checkbox"/> Stream <input type="checkbox"/> Riparian Area <input type="checkbox"/> Lt bank <input type="checkbox"/> Rt bank		LAND OWNERSHIP: <input type="checkbox"/> Public <input type="checkbox"/> Unknown <input type="checkbox"/> Private AMOUNT (# Pickup truck loads):			
POTENTIAL RESTORATION CANDIDATE <input type="checkbox"/> Stream cleanup <input type="checkbox"/> Stream adoption segment <input type="checkbox"/> Removal/prevention of dumping <input type="checkbox"/> no <input type="checkbox"/> Other:														
<i>If yes for trash or debris removal</i>	EQUIPMENT NEEDED : <input type="checkbox"/> Heavy equipment <input type="checkbox"/> Trash bags <input type="checkbox"/> Unknown									DUMPSTER WITHIN 100 FT: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown				
	WHO CAN DO IT: <input type="checkbox"/> Volunteers <input type="checkbox"/> Local Gov <input type="checkbox"/> Hazmat Team <input type="checkbox"/> Other													
CLEAN-UP POTENTIAL: (<i>Circle #</i>)	A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access			A large amount of trash, or bulk items, in a small area with easy access. Trash may have been dumped over a long period of time but it could be cleaned up in a few days, possibly with a small backhoe.			A large amount of trash or debris scattered over a large area, where access is very difficult. Or presence of drums or indications of hazardous materials							
	5			4			3			2		1		
NOTES:														
REPORTED TO AUTHORITIES <input type="checkbox"/> YES <input type="checkbox"/> NO														

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POTENTIAL RESTORATION CANDIDATE <input type="checkbox"/> Structural repairs <input type="checkbox"/> Pipe testing <input type="checkbox"/> Citizen hotlines <input type="checkbox"/> Dry weather sampling <input type="checkbox"/> no <input type="checkbox"/> Fish barrier removal <input type="checkbox"/> Other:																					
If yes to fish barrier, Water Drop: ____ (in)																					
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REPORTED TO LOCAL AUTHORITIES <input type="checkbox"/> Yes <input type="checkbox"/> No																					

WATERSHED/SUBSHED:		DATE: ____/____/____	ASSESSED BY:	
SURVEY REACH ID:		TIME: ____:____AM/PM	PHOTO ID: (Camera-Pic #) _____/#	
SITE ID: (Condition-#)	MI-_____	LAT ____° ____' ____" LONG ____° ____' ____"	LMK: _____	GPS: (Unit ID)
POTENTIAL RESTORATION CANDIDATE <input type="checkbox"/> Storm water retrofit <input type="checkbox"/> Stream restoration <input type="checkbox"/> Riparian Management <input type="checkbox"/> no <input type="checkbox"/> Discharge Prevention <input type="checkbox"/> Other:				
DESCRIBE: 				
REPORTED TO LOCAL AUTHORITIES <input type="checkbox"/> Yes <input type="checkbox"/> No				

WATERSHED/SUBSHED:	DATE: ____/____/____	ASSESSED BY:	
SURVEY REACH ID:	TIME: ____:____AM/PM	PHOTO ID: (<i>Camera-Pic #</i>) _____ /#	
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DESCRIBE:			
<div style="text-align: right;"> REPORTED TO LOCAL AUTHORITIES <input type="checkbox"/> Yes <input type="checkbox"/> No </div>			

WATERSHED/SUBSHED:	DATE: ____/____/____	ASSESSED BY:
SURVEY REACH ID:	TIME: ____:____AM/PM	PHOTO ID: (<i>Camera-Pic #</i>) _____ /#
SITE ID: (<i>Condition-#</i>) MI- _____	LAT ____° ____' ____" LONG ____° ____' ____" LMK: _____	GPS: (<i>Unit ID</i>) _____
POTENTIAL RESTORATION CANDIDATE <input type="checkbox"/> Storm water retrofit <input type="checkbox"/> Stream restoration <input type="checkbox"/> Riparian Management <input type="checkbox"/> no <input type="checkbox"/> Discharge Prevention <input type="checkbox"/> Other:		
DESCRIBE:		
REPORTED TO LOCAL AUTHORITIES <input type="checkbox"/> Yes <input type="checkbox"/> No		

SURVEY REACH ID: _____			WTRSHD/SUBSHD: _____			DATE: __/__/__			ASSESSED BY: _____																		
START TIME: ____:____AM/PM LMK: _____ LAT ____° ____' ____" LONG ____° ____' ____"									END TIME: ____:____AM/PM LMK: _____ LAT ____° ____' ____" LONG ____° ____' ____"									GPS ID: _____									
DESCRIPTION:									DESCRIPTION:																		
RAIN IN LAST 24 HOURS <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent <input type="checkbox"/> None <input type="checkbox"/> Intermittent <input type="checkbox"/> Trace																		PRESENT CONDITIONS <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent <input type="checkbox"/> Clear <input type="checkbox"/> Trace <input type="checkbox"/> Overcast <input type="checkbox"/> Partly cloudy									
SURROUNDING LAND USE: <input type="checkbox"/> Industrial <input type="checkbox"/> Commercial <input type="checkbox"/> Urban/Residential <input type="checkbox"/> Suburban/Res <input type="checkbox"/> Forested <input type="checkbox"/> Institutional <input type="checkbox"/> Golf course <input type="checkbox"/> Park <input type="checkbox"/> Crop <input type="checkbox"/> Pasture <input type="checkbox"/> Other:																											
AVERAGE CONDITIONS (<i>check applicable</i>)										REACH SKETCH AND SITE IMPACT TRACKING																	
BASE FLOW AS % <input type="checkbox"/> 0-25% <input type="checkbox"/> 50%-75% CHANNEL WIDTH <input type="checkbox"/> 25-50 % <input type="checkbox"/> 75-100%										<i>Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB, SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow</i>																	
DOMINANT SUBSTRATE <input type="checkbox"/> Silt/clay (fine or slick) <input type="checkbox"/> Cobble (2.5 –10") <input type="checkbox"/> Sand (gritty) <input type="checkbox"/> Boulder (>10") <input type="checkbox"/> Gravel (0.1-2.5") <input type="checkbox"/> Bed rock																											
WATER CLARITY <input type="checkbox"/> Clear <input type="checkbox"/> Turbid (<i>suspended matter</i>) <input type="checkbox"/> Stained (<i>clear, naturally colored</i>) <input type="checkbox"/> Opaque (<i>milky</i>) <input type="checkbox"/> Other (<i>chemicals, dyes</i>)																											
AQUATIC PLANTS Attached: <input type="checkbox"/> none <input type="checkbox"/> some <input type="checkbox"/> lots IN STREAM Floating: <input type="checkbox"/> none <input type="checkbox"/> some <input type="checkbox"/> lots																											
WILDLIFE IN OR AROUND STREAM (Evidence of) <input type="checkbox"/> Fish <input type="checkbox"/> Beaver <input type="checkbox"/> Deer <input type="checkbox"/> Snails <input type="checkbox"/> Other:																											
STREAM SHADING (water surface) <input type="checkbox"/> Mostly shaded (≥75% coverage) <input type="checkbox"/> Halfway (≥50%) <input type="checkbox"/> Partially shaded (≥25%) <input type="checkbox"/> Unshaded (< 25%)																											
CHANNEL DYNAMICS <input type="checkbox"/> Downcutting <input type="checkbox"/> Bed scour <input type="checkbox"/> Widening <input type="checkbox"/> Bank failure <input type="checkbox"/> Headcutting <input type="checkbox"/> Bank scour <input type="checkbox"/> Unknown <input type="checkbox"/> Aggrading <input type="checkbox"/> Slope failure <input type="checkbox"/> Sed. deposition <input type="checkbox"/> Channelized																											
CHANNEL DIMENSIONS Height: LT bank _____(ft) RT bank _____(ft) (FACING Width: Bottom _____(ft) DOWNSTREAM) Top _____(ft)																											
REACH ACCESSIBILITY																											
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.					Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.					Difficult: Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.																	
5 4 3 2 1																											
NOTES: (<i>biggest problem you see in survey reach</i>)																											
REPORTED TO AUTHORITIES <input type="checkbox"/> YES <input type="checkbox"/> NO																											

OVERALL STREAM CONDITION																					
	Optimal					Suboptimal					Marginal					Poor					
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).					40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).					20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
	Right Bank	10	9			8	7	6			5	4	3			2	1	0			
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.					Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure					Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.					
	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
	Right Bank	10	9			8	7	6			5	4	3			2	1	0			
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.					High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.					High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.					High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
OVERALL BUFFER AND FLOODPLAIN CONDITION																					
	Optimal					Suboptimal					Marginal					Poor					
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.					Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.					Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.					Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.					
	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
	Right Bank	10	9			8	7	6			5	4	3			2	1	0			
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest					Predominant floodplain vegetation type is young forest					Predominant floodplain vegetation type is shrub or old field					Predominant floodplain vegetation type is turf or crop land					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water					Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water					Either all wetland or all non-wetland habitat, evidence of standing/ponded water					Either all wetland or all non-wetland habitat, no evidence of standing/ponded water					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FLOODPLAIN ENCROACHMENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures					Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function					Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function					Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Sub Total In-stream: ____ /80 + Buffer/Floodplain: ____ /80 = Total Survey Reach ____ /160																					

Photo Inventory

(By Camera)

Project: _____

Group: _____

Camera: _____

This field sheet is to be completed AS photos are taken in the field. The intent is to organize pictures taken on each camera. Fill out one sheet per camera (add sheets as needed). Only fill in Date/Reach/Location ID when you start in a new spatial or temporal location.

Date	Stream/ Reach	Location ID	Photo #	Description

Date	Stream/ Reach	Location ID	Photo #	Description

Comments:

(BACK)

CHANNEL ALTERATION

CA

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Type: Concrete, Gabion, Rip-rap, Earth Channel, Other: _____

Bottom Width: _____ in Length: _____ ft.

Does channel have perennial flow? Yes No

Is sediment deposition occurring in the channel? Yes No

Is vegetation growing in the channel? Yes No

Is it part of a road crossing? No Above Below Both

Channelized length above road crossing _____ ft.

Channelized length below road crossing _____ ft.

Severity	Severe	1	2	3	4	5	Minor	Unknown (-1)
Correctability	Best	1	2	3	4	5	Worst	Unknown (-1)
Access	Best	1	2	3	4	5	Worst	Unknown (-1)

CHANNEL ALTERATION

CA

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Type: Concrete, Gabion, Rip-rap, Earth Channel, Other: _____

Bottom Width: _____ in Length: _____ ft.

Does channel have perennial flow? Yes No

Is sediment deposition occurring in the channel? Yes No

Is vegetation growing in the channel? Yes No

Is it part of a road crossing? No Above Below Both

Channelized length above road crossing _____ ft.

Channelized length below road crossing _____ ft.

Severity	Severe	1	2	3	4	5	Minor	Unknown (-1)
Correctability	Best	1	2	3	4	5	Worst	Unknown (-1)
Access	Best	1	2	3	4	5	Worst	Unknown (-1)

EROSION SITE

ES

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Type: Downcutting **Widening** **Headcutting** **Unknown****Cause:** **Bend** at steep slope, **Pipe Outfall**, Below **Channelization**, Below **Road Crossing**,
Livestock, **Land Use Change Upstream**, **Other:** _____**Length:** _____ ft. **Average exposed bank height:** _____ ft.**Present Land Use Left Side (looking downstream):** **Crop field**, **Pasture**, **Lawn**, **Paved**, **Shrubs & Small Trees**,
Forest, **Multiflora Rose**, **Other** _____**Present Land Use Right Side (looking downstream):** **Crop field**, **Pasture**, **Lawn**, **Paved**, **Shrubs & Small Trees**,
Forest, **Multiflora Rose**, **Other** _____**Threat to Infrastructure?:** **Yes** **No** **Describe:** _____**Severity** Severe **1** **2** **3** **4** **5** Minor Unknown (-1)**Correctability** Best **1** **2** **3** **4** **5** Worst Unknown (-1)**Access** Best **1** **2** **3** **4** **5** Worst Unknown (-1)

EROSION SITE

ES

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Type: Downcutting **Widening** **Headcutting** **Unknown****Cause:** **Bend** at steep slope, **Pipe Outfall**, Below **Channelization**, Below **Road Crossing**,
Livestock, **Land Use Change Upstream**, **Other:** _____**Length:** _____ ft. **Average exposed bank height:** _____ ft.**Present Land Use Left Side (looking downstream):** **Crop field**, **Pasture**, **Lawn**, **Paved**, **Shrubs & Small Trees**,
Forest, **Multiflora Rose**, **Other** _____**Present Land Use Right Side (looking downstream):** **Crop field**, **Pasture**, **Lawn**, **Paved**, **Shrubs & Small Trees**,
Forest, **Multiflora Rose**, **Other** _____**Threat to Infrastructure?:** **Yes** **No** **Describe:** _____**Severity** Severe **1** **2** **3** **4** **5** Minor Unknown (-1)**Correctability** Best **1** **2** **3** **4** **5** Worst Unknown (-1)**Access** Best **1** **2** **3** **4** **5** Worst Unknown (-1)

EXPOSED PIPE

EP

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Pipe is: Exposed across bottom of stream, Exposed along stream bank, Exposed manhole,
Above stream, Other: _____

Type of Pipe: Concrete, Smooth Metal, Corrugated Metal, Plastic, Terra Cotta, Other: _____

Pipe Diameter: _____ in. **Length exposed:** _____ ft.

Purpose of Pipe: Sewage, Water Supply, Stormwater, Unknown, Other: _____

Evidence of Discharge?: Yes No

Color: Clear, medium brown, dark brown, green brown, yellow brown, green, other: _____

Odor: Sewage, oily, musky, fishy, rotten eggs, chlorine, none, other: _____

Severity	Severe	1	2	3	4	5	Minor	Unknown (-1)
-----------------	--------	---	---	---	---	---	-------	--------------

Correctability	Best	1	2	3	4	5	Worst	Unknown (-1)
-----------------------	------	---	---	---	---	---	-------	--------------

Access	Best	1	2	3	4	5	Worst	Unknown (-1)
---------------	------	---	---	---	---	---	-------	--------------

EXPOSED PIPE

EP

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Pipe is: Exposed across bottom of stream, Exposed along stream bank, Exposed manhole,
Above stream, Other: _____

Type of Pipe: Concrete, Smooth Metal, Corrugated Metal, Plastic, Terra Cotta, Other: _____

Pipe Diameter: _____ in. **Length exposed:** _____ ft.

Purpose of Pipe: Sewage, Water Supply, Stormwater, Unknown, Other: _____

Evidence of Discharge?: Yes No

Color: Clear, medium brown, dark brown, green brown, yellow brown, green, other: _____

Odor: Sewage, oily, musky, fishy, rotten eggs, chlorine, none, other: _____

Severity	Severe	1	2	3	4	5	Minor	Unknown (-1)
-----------------	--------	---	---	---	---	---	-------	--------------

Correctability	Best	1	2	3	4	5	Worst	Unknown (-1)
-----------------------	------	---	---	---	---	---	-------	--------------

Access	Best	1	2	3	4	5	Worst	Unknown (-1)
---------------	------	---	---	---	---	---	-------	--------------

PIPE OUTFALL

PO

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Type of Outfall: Stormwater, Sewage Overflow, Industrial, Pumping Station,
Agricultural, Other: _____

Type of Pipe: Earth Channel, Concrete Channel, Concrete Pipe, Smooth Metal Pipe,
Corrugated Metal, Plastic, Other: _____

Location (facing downstream): left bank, right bank, head of stream, Other _____

Pipe Diameter: _____ in. **Channel width:** _____ ft.

Evidence of Discharge?: Yes No

Color: Clear, medium brown, dark brown, green brown, yellow brown, green, other: _____

Odor: Sewage, oily, musky, fishy, rotten eggs, chlorine, none, other: _____

Severity	Severe	1	2	3	4	5	Minor	Unknown (-1)
-----------------	--------	---	---	---	---	---	-------	--------------

Correctability	Best	1	2	3	4	5	Worst	Unknown (-1)
-----------------------	------	---	---	---	---	---	-------	--------------

Access	Best	1	2	3	4	5	Worst	Unknown (-1)
---------------	------	---	---	---	---	---	-------	--------------

PIPE OUTFALL

PO

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Type of Outfall: Stormwater, Sewage Overflow, Industrial, Pumping Station,
Agricultural, Other: _____

Type of Pipe: Earth Channel, Concrete Channel, Concrete Pipe, Smooth Metal Pipe,
Corrugated Metal, Plastic, Other: _____

Location (facing downstream): left bank, right bank, head of stream, Other _____

Pipe Diameter: _____ in. **Channel width:** _____ ft.

Evidence of Discharge?: Yes No

Color: Clear, medium brown, dark brown, green brown, yellow brown, green, other: _____

Odor: Sewage, oily, musky, fishy, rotten eggs, chlorine, none, other: _____

Severity	Severe	1	2	3	4	5	Minor	Unknown (-1)
-----------------	--------	---	---	---	---	---	-------	--------------

Correctability	Best	1	2	3	4	5	Worst	Unknown (-1)
-----------------------	------	---	---	---	---	---	-------	--------------

Access	Best	1	2	3	4	5	Worst	Unknown (-1)
---------------	------	---	---	---	---	---	-------	--------------

FISH BARRIER

FB

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Fish Blockage: **Total**, **Partial**, **Temporary**, **Unknown**Type of Barrier: **Dam**, **Road Crossing**, **Pipe Crossing**, **Natural Falls**, **Beaver Dam**, **Channelized**, **Instream Pond**,
Debris Dam, **Other**: _____Blockage because: Too **high** Too **shallow** Too **fast**

Water drop: _____ inches (if too high)

Water depth: _____ inches (if too shallow)

Severity	Severe	1	2	3	4	5	Minor	Unknown (-1)
Correctability	Best	1	2	3	4	5	Worst	Unknown (-1)
Access	Best	1	2	3	4	5	Worst	Unknown (-1)

FISH BARRIER

FB

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Fish Blockage: **Total**, **Partial**, **Temporary**, **Unknown**Type of Barrier: **Dam**, **Road Crossing**, **Pipe Crossing**, **Natural Falls**, **Beaver Dam**, **Channelized**, **Instream Pond**,
Debris Dam, **Other**: _____Blockage because: Too **high** Too **shallow** Too **fast**

Water drop: _____ inches (if too high)

Water depth: _____ inches (if too shallow)

Severity	Severe	1	2	3	4	5	Minor	Unknown (-1)
Correctability	Best	1	2	3	4	5	Worst	Unknown (-1)
Access	Best	1	2	3	4	5	Worst	Unknown (-1)

INADEQUATE BUFFER

IB

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Buffer inadequate on: Left Right Both (looking downstream)

Is stream unshaded? Left Right Both (looking downstream) Neither

Buffer width left: _____ ft. Buffer width right: _____ ft.

Length left: _____ ft. Length right: _____ ft.

Present land use left side: Crop field, Pasture, Lawn, Paved, Shrubs & Small Trees,
Forest, Multiflora Rose, Other _____Present land use right side: Crop field, Pasture, Lawn, Paved, Shrubs & Small Trees,
Forest, Multiflora Rose, Other _____

Has a buffer recently been established: Yes No

Are Livestock present: Yes No Type: Cattle, Horses, Pigs, Other: _____

Severity Severe 1 2 3 4 5 Minor Unknown (-1)

Correctability Best 1 2 3 4 5 Worst Unknown (-1)

Access Best 1 2 3 4 5 Worst Unknown (-1)

Wetland Potential Best 1 2 3 4 5 Worst Unknown (-1)

(Good wetland potential = low slope, low bank height)

INADEQUATE BUFFER

IB

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Buffer inadequate on: Left Right Both (looking downstream)

Is stream unshaded? Left Right Both (looking downstream) Neither

Buffer width left: _____ ft. Buffer width right: _____ ft.

Length left: _____ ft. Length right: _____ ft.

Present land use left side: Crop field, Pasture, Lawn, Paved, Shrubs & Small Trees,
Forest, Multiflora Rose, Other _____Present land use right side: Crop field, Pasture, Lawn, Paved, Shrubs & Small Trees,
Forest, Multiflora Rose, Other _____

Has a buffer recently been established: Yes No

Are Livestock present: Yes No Type: Cattle, Horses, Pigs, Other: _____

Severity Severe 1 2 3 4 5 Minor Unknown (-1)

Correctability Best 1 2 3 4 5 Worst Unknown (-1)

Access Best 1 2 3 4 5 Worst Unknown (-1)

Wetland Potential Best 1 2 3 4 5 Worst Unknown (-1)

(Good wetland potential = low slope, low bank height)

IN OR NEAR STREAM CONSTRUCTION

IC

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Type of activity: Road, Road Crossing, Utility, Logging, Bank Stabilization, Residential Development, Industrial Development, Other: _____

Sediment Control: Adequate Inadequate Unknown

If inadequate, why? _____

Is stream bottom below site laden with excess sediment? Yes No

Length of stream affected: _____ ft.

Company doing construction: _____

Location: _____

Severity Severe 1 2 3 4 5 Minor Unknown (-1)

Contact office as soon as possible: ()

IN OR NEAR STREAM CONSTRUCTION

IC

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Type of activity: Road, Road Crossing, Utility, Logging, Bank Stabilization, Residential Development, Industrial Development, Other: _____

Sediment Control: Adequate Inadequate Unknown

If inadequate, why? _____

Is stream bottom below site laden with excess sediment? Yes No

Length of stream affected: _____ ft.

Company doing construction: _____

Location: _____

Severity Severe 1 2 3 4 5 Minor Unknown (-1)

Contact office as soon as possible: ()

TRASH DUMPING

TD

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Type of trash: Residential, Industrial, Yard Waste, Flotables, Tires, Construction,
Other: _____

Amount of trash: _____ pick-up truck loads

Other measure: _____

Is trash confined to? Single site, Large Area

Possible cleanup site for volunteers? Yes No

Land Ownership: Public Private Unknown

If public, name: _____

Severity	Severe	1	2	3	4	5	Minor	Unknown (-1)
Correctability	Best	1	2	3	4	5	Worst	Unknown (-1)
Access	Best	1	2	3	4	5	Worst	Unknown (-1)

TRASH DUMPING

TD

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Type of trash: Residential, Industrial, Yard Waste, Flotables, Tires, Construction,
Other: _____

Amount of trash: _____ pick-up truck loads

Other measure: _____

Is trash confined to? Single site, Large Area

Possible cleanup site for volunteers? Yes No

Land Ownership: Public Private Unknown

If public, name: _____

Severity	Severe	1	2	3	4	5	Minor	Unknown (-1)
Correctability	Best	1	2	3	4	5	Worst	Unknown (-1)
Access	Best	1	2	3	4	5	Worst	Unknown (-1)

UNUSUAL CONDITION OR COMMENT

UC

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Type: (circle one) **Unusual Condition** **Comment**

Describe: **O**dor, **S**cum, Excessive **A**lgae, **W**ater **C**olor/Clarity, **R**ed **F**lock, **S**ewage **D**ischarge, **O**il

Potential Cause: _____

Severity	Severe	1	2	3	4	5	Minor	Unknown (-1)
Correctability	Best	1	2	3	4	5	Worst	Unknown (-1)
Access	Best	1	2	3	4	5	Worst	Unknown (-1)

UNUSUAL CONDITION OR COMMENT

UC

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Type: (circle one) **Unusual Condition** **Comment**

Describe: **O**dor, **S**cum, Excessive **A**lgae, **W**ater **C**olor/Clarity, **R**ed **F**lock, **S**ewage **D**ischarge, **O**il

Potential Cause: _____

Severity	Severe	1	2	3	4	5	Minor	Unknown (-1)
Correctability	Best	1	2	3	4	5	Worst	Unknown (-1)
Access	Best	1	2	3	4	5	Worst	Unknown (-1)

REPRESENTATIVE SITE

RE

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Optimal

Suboptimal

Marginal

Poor

Macroinvertebrate Substrata

Embeddedness

Shelter for fish

Channel Alteration

Sediment Deposition

Velocity and Depth

Channel Flow

Bank Vegetation

Bank Condition

Riparian Vegetation

Wetted width: **Riffles:** _____ in. **Runs:** _____ in. **Pools:** _____ in.**Thalweg depth:** **Riffles:** _____ in. **Runs:** _____ in. **Pools:** _____ in.**Bottom type:** Silts, Sands, Gravel, Cobble, Boulder, Bedrock

REPRESENTATIVE SITE

RE

Map: _____

Team: _____

Site: _____

Date: ____/____/____
M M D D Y Y

Photo: _____

Survey: _____

Optimal

Suboptimal

Marginal

Poor

Macroinvertebrate Substrata

Embeddedness

Shelter for fish

Channel Alteration

Sediment Deposition

Velocity and Depth

Channel Flow

Bank Vegetation

Bank Condition

Riparian Vegetation

Wetted width: **Riffles:** _____ in. **Runs:** _____ in. **Pools:** _____ in.**Thalweg depth:** **Riffles:** _____ in. **Runs:** _____ in. **Pools:** _____ in.**Bottom type:** Silts, Sands, Gravel, Cobble, Boulder, Bedrock

HABITAT ASSESSMENT

Rocky Bottom Streams

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
1. Attachment Sites for Macroinvertebrates (see page 67)	Well-developed riffle and run; riffle is as wide as stream and length extends two times the width of stream; cobble predominates; boulders and gravel common.	Riffle is as wide as stream but length is less than two times width; cobble less abundant; boulders and gravel common.	Run area may be lacking; riffle not as wide as stream and its length is less than 2 times the stream width; gravel or large boulders and bedrock prevalent; some cobble present.	Riffles or run virtually nonexistent; large boulders and bedrock prevalent; cobble lacking.
2. Embeddedness (see page 67)	Fine sediment surrounds and fills in 0-25% of the living spaces around and in between the gravel, cobble, and boulders.	Fine sediment surrounds and fills in 25-50% of the living spaces around and in between the gravel, cobble, and boulders.	Fine sediment surrounds and fills in 50-75% of the living spaces around and in between the gravel, cobble, and boulders.	Fine sediment surrounds and fills in more than 75% of the living spaces around and in between the gravel, cobble, and boulders.
3. Shelter for Fish (see page 67)	Snags, submerged logs, undercut banks, or other stable habitat are found in over 50% of the site.	Snags, submerged logs, undercut banks, or other stable habitat are found in over 30-50% of the site.	Snags, submerged logs, undercut banks, or other stable habitat are found in over 10-30% of the site.	Snags, submerged logs, undercut banks, or other stable habitat are found in less than 10% of the site.
4. Channel Alteration (see page 67)	Stream straightening, dredging, artificial embankments, dams or bridge abutments absent or minimal; stream with meandering pattern.	Some stream straightening, dredging, artificial embankments or dams present, usually in area of bridge abutments; no evidence of recent channel alteration activity.	Artificial embankments present to some extent on both banks; and 40 to 80% of stream site straightened, dredged, or otherwise altered.	Banks shored with gabion or cement; over 80% of the stream site straightened and disrupted.
5. Sediment Deposition (see page 67)	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, coarse sand on old and new bars; 30-50% of the bottom affected; sediment deposits at stream obstructions and bends; moderate deposition in pools.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom affected; pools almost absent due to substantial sediment deposition.
6. Stream velocity and depth combinations (see page 67)	Slow (< 1 ft/sec)/shallow (< 1 ft); slow/deep, fast/deep; fast/shallow; all four combinations present	3 of the 4 velocity/depth combinations present; fast current areas generally predominate.	Only 2 of the 4 velocity/depth combinations are present. Score lower if last current areas are missing.	Dominated by 1 velocity/depth category (usually slow/shallow areas)
7. Channel Flow Status (see page 68)	Water reaches base of both lower banks and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; <25% of channel substrate is exposed.	Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
8. Bank Vegetative Protection (see page 68)	More than 90% of the streambank surfaces covered by natural vegetation, including trees, shrubs, or other plants, vegetative disruption, through grazing or mowing, minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by natural vegetation, but one class of plants is not well-represented; some vegetative disruption evident; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; patches of bare soil or closely cropped vegetation common; less than one half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation, disruption of streambank vegetation is very high; vegetation has been removed to 2 inches or less in average stubble height.
9. Condition of Banks (see page 68)	Banks stable, no evidence of erosion or bank failure; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over.	Moderately unstable; up to 60% of banks in site have areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank collapse or failure; 60-100% of bank has erosional scars.
10. Riparian Vegetative Zone Width (see page 68)	Width of riparian zone >50 feet; no evidence of human activities (i.e., parking lots, roadbeds, clear-cuts, mowed areas, or crops) within the riparian zone.	Width of riparian zone 35-40 feet.	Width of riparian zone 20-35 feet.	Width of riparian zone <20 feet.

HABITAT CHARACTERISTICS DEFINITIONS

Use the habitat characteristic (parameter) definitions and guidance that follows when completing the habitat assessment field data form. Rocky-bottom streams (Piedmont Streams) are generally fast moving streams with beds that are made up to gravel/cobbles/boulders in any combination and that have definite riffle areas.

1. **Attachment Sites for Macroinvertebrates** are essentially the amount of living space or hard substrates (rocks, snags) available for aquatic insects and snails. Many insects begin their life underwater in streams and need to attach themselves to rocks, logs, branches, or other submerged substrates. The greater the variety and number of available living spaces or attachment sites, the greater the variety of insects in the stream. Optimally, there should be a predominance of cobble, and boulders and gravel should be common. The availability of suitable living spaces for macroinvertebrates decreases as cobble becomes less abundant and boulders, gravel, or bedrock become more prevalent.
2. **Embeddedness** refers to the extent to which rocks (gravel, cobble, and boulders) are surrounded by, covered, or sunken into the silt, sand, or mud of the stream bottom. Generally, as rocks become embedded, the living spaces available to macroinvertebrates and fish for shelter, spawning, and egg incubation are decreased.

To estimate the percent of embeddedness, observe the amount of silt or finer sediments overlying and surrounding the rocks. If kicking does not dislodge the rocks or cobbles, they may be greatly embedded. It may be useful to lift a few rocks and observe how much of the rock (e.g., 1/2, 1/3) is darker due to algal growth.
3. **Shelter for Fish** includes the relative quantity and variety of natural structures in the stream, such as fallen trees, logs, and branches, large rocks, and undercut banks that are available to fish for hiding, sleeping, or laying eggs. A wide variety of submerged structures in the stream provide fish with many living spaces; the more living spaces in a stream, the more types of fish the stream can support.
4. **Channel Alteration** is basically a measure of large-scale changes in the shape of the stream channel. Many streams in urban and agricultural areas have

been straightened, deepened (e.g. dredged), or diverted into concrete channels, often for flood control purposes. Such streams have far fewer natural habitats for fish, macroinvertebrates, and plants than do naturally meandering streams. Channel alteration is present when the stream runs through a concrete channel; when artificial embankments, riprap, and other forms of artificial bank stabilization or structures are present; when the stream is very straight for significant distances; when dams, bridges, and flow altering structures such as combined sewer overflow pipes are present; when the stream is of uniform depth due to dredging, and when other such changes have occurred.

Signs that indicate the occurrence of dredging include straightened, deepened, and otherwise uniform stream channels, and the removal of streamside vegetation to provide access to the stream for dredging equipment.

5. **Sediment Deposition** is a measure of the amount of sediment that has been deposited in the stream channel and the changes to the stream bottom that have occurred as a result of the deposition. High levels of sediment deposition create an unstable and continually changing environment that is unsuitable for many aquatic organisms.

Sediments are naturally deposited in areas where the stream flow is reduced, such as pools and bends, or where flow is obstructed. These deposits can lead to the formation of islands, shoals, or point bars (sediments that build up in the stream, usually at the beginning of a meander) or can result in the complete filling of pools. To determine whether or not these sediment deposits are new, look for vegetation growing on them; new sediments will not yet have been colonized by vegetation.
6. **Stream Velocity and Depth Combinations** are important to the maintenance of aquatic communities. Restrictions to normal velocity and/or the filling of pools will affect the organisms living in the stream by reducing the dissolved oxygen that is available and by slowing down the movement of food items. Streams function best when the movement of water continually replenishes the supply of oxygen and food, and does not become stagnant.

Slow velocity is generally described as water moving **less than (<) 1 foot/second**

Fast velocity is generally described as water moving **greater than (>) 1 foot/second**

Shallow water is generally described as **less than (<) 1.5 feet**

Deep water is generally described as **greater than (>) 1.5 feet**

Four general categories of velocity and depth are optimal for benthic macroinvertebrate and fish communities. The best streams will have all four velocity/depth combinations and can maintain a wide variety of aquatic life:

- (1) *slow, shallow*
- (2) *slow, deep*
- (3) *fast, deep*
- (4) *fast, shallow*

Depth can be estimated by standing in the stream at various points. If the water level comes to below the bottom of your knee cap, it can be considered shallow. If it reaches above the bottom of your knee cap, consider it deep. Also, you can use the measuring rope to measure the length of your leg to the knee cap to judge depth.

To estimate velocity, use the measuring rope to mark off 10-foot areas of stream in the same general areas where you measured depth. Drop a twig in the stream and count the number of seconds it takes for the stick to travel the 10 feet. Generally it is best to do this in run and pool areas since velocity is difficult to measure in riffles as the twig may get caught up by rocks. Divide 10 by the number of seconds to determine velocity in “feet per second.” For example:

If the twig took 6 seconds to travel the 10 foot distance, then divide 6 seconds into 10 feet, which is equal to 1.4 ft/sec. In this case, the velocity would be considered fast, as it is greater than 1 ft/sec.

Since water in riffle areas tends to have the greatest velocity, you can assume that riffle velocity is faster than velocity in either the run or pool areas you measure.

7. **Channel Flow Status** is the percent of the existing channel that is filled with water. The flow status will change as the channel enlarges or as flow decreases as a result of dams and other obstruc-

tions, diversions for irrigation, or drought. When water does not cover much of the streambed, the amount of living area for aquatic organisms is limited.

8. **Bank Vegetative Protection** measures the amount of the stream bank that is covered by natural (i.e. growing wild and not obviously planted) vegetation. The root systems of plants growing on stream banks help hold soil in place, reducing erosion. Vegetation on banks provides shade for fish and macroinvertebrates, and serves as a food source by dropping leaves and other organic matter into the stream. Ideally, a variety of vegetation should be present, including trees, shrubs, and grasses. Vegetative disruption may occur when the grasses and plants on the stream banks are mowed or grazed upon, or the trees and shrubs are cut back or cleared.
9. **Condition of Banks** measures erosion potential and whether the stream banks are eroded. Steep banks are more likely to collapse and suffer from erosion than are gently sloping banks and are therefore considered to have a high erosion potential. Signs of erosion include crumbling, unvegetated banks, exposed tree roots, and exposed soil. Bank failure and the subsequent collapse of portions of the stream bank is referred to as bank sloughing.
10. **The Riparian Vegetative Zone Width** is defined here as the width of natural vegetation from the edge of the stream bank. The riparian vegetative zone is a buffer zone to pollutants entering a stream from runoff; it also controls erosion and provides stream habitat and nutrient input into the stream. A wide, relatively undisturbed riparian vegetative zone reflects a healthy stream system; narrow, far less useful riparian zones occur when roads, parking lots, fields, lawns and other artificially cultivated areas, bare soil, rocks, or buildings are near the stream bank. The presence of “old fields” (i.e., previously developed agricultural fields allowed to convert to natural conditions) should rate higher than fields in continuous or periodic use. In arid areas, the riparian vegetative zone can be measured by observing the width of the area dominated by riparian or water-loving plants, such as willows, marsh grasses, and cottonwood trees.